CLAIMS

1. A linear motor (10) comprising a stator (411) and an actuator, the stator (411) being fed by a controlled voltage (V_M), the controlled voltage (V_M) being applied to the linear motor (10) and adjusted by a processing unit (22),

- the linear motor (10) moving a load from the actuator displacement, the linear motor (10) forming a resonant assembly with the load, the resonant assembly having a resonance frequency,

- the linear motor (10) being characterized in that a displacement range is controlled by means of the controlled voltage (V_M) through the processing unit (22), to dynamically keep the resonant assembly resonance throughout the load variations.

2. A linear motor (10) according to claim 1, characterized in that the controlled voltage (V_M) generates a feed current (i_A) that circulates in the linear motor (10),

a processing unit (22) measuring a feed phase (ϕ_C) of the feed current (i_A) and the dynamic phase (ϕ_P) of the actuator,

the processing unit (22) measuring the difference between the feed phase (ϕ_C) and the dynamic phase (ϕ_P) and establishing a measured phase (ϕ_{PC}), the processing unit (22) adjusting the controlled voltage (V_M) so that the value of the measured phase (ϕ_{PC}) will be null.

3. A linear motor according to claim 1, characterized in that the controlled voltage (V_M) is adjusted by means of a variable frequency inverter, the inverter dynamically adjusting the voltage frequency (f_{VM}) of the controlled voltage (V_M) to a value equal to the value of the resonance frequency of the resonant assembly, as the load variations occur.

4. A linear compressor (100) applicable to a cooling system (20), the linear compressor (100) comprising a piston (1) driven by a linear motor (10).

5. A linear compressor according to claim 4, characterized in that the controlled voltage (V_M) is adjusted by means of a variable frequency inverter, the inverter dynamically adjusting the voltage frequency (f_{VM}) of the

controlled voltage (V_M) to a value equal to the value of the resonance frequency of the linear compressor (100), as the variations in demand of the cooling system (20) occur.

6. A linear compressor according tot claim 4, characterized in that the controlled voltage (V_M) generates a feed current (i_A) that circulates in the linear motor (10),

the processing unit (22) measuring a feed phase (ϕ_C) of the feed current (i_A) and the dynamic phase (ϕ_P) of the piston (1) of the linear compressor (100),

the processing unit (22) measuring the difference between the feed phase (ϕ_C) and the dynamic phase (ϕ_P) and establishing a measured phase (ϕ_{PC}), the processing unit (22) adjusting the controlled voltage (V_M) so that the value of the measured phase (ϕ_{PC}) will be null.

7. A linear compressor according to claim 6, characterized in that the controlled voltage (V_M) is decreased when the value of measured phase (ϕ_{PC}) is positive and increased quant the measured phase (ϕ_{PC}) is negative.

8. A linear compressor according to claim 7, characterized in that the feed phase (ϕ_C) is obtained from a pre-defined moment of the feed current (i_A).

9. A linear compressor according to claim 8, characterized in that the pre-defined moment of the feed current (i_A) is the passage of the feed current (i_A) by zero.

10. A linear compressor according to claim 7, characterized on that the pre-defined moment is obtained at the middle point of the permanence of the feed current (i_A) at zero.

11. A linear compressor according to claim 5, characterized in that the dynamic phase (ϕ_P) is obtained from a signal of piston (1) displacement (DP).

12. A linear compressor according to claim 6, characterized in that the value of the dynamic phase (ϕ_P) is obtained by means of a displacement sensor (30) electrically associated to the processing unit (22).

13. A linear compressor according to claim 12, characterized in

that the value of the dynamic phase (ϕ_P) is obtained from the position of piston (1) displacement (DP).

14. A method of controlling a linear compressor (100), the linear compressor (100) comprising a piston (1) driven by a linear motor (10),

the piston (1) having a displacement range controlled by means of a controlled voltage (V_M), the controlled voltage (V_M) having a voltage frequency (f_{VM}) applied to the linear motor (10) and adjusted by means of a processing unit (22),

the method being characterized by comprising the steps of

- monitoring the piston (1) displacement range throughout the operation of the linear compressor (100),

- dynamically adjusting the displacement range in function of the variation in demand of the linear compressor (100), to keep the linear compressor (100) in resonance throughout the variations in demand of the cooling system (20).

15. A method according to claim 14, characterized in that, in the step of dynamically adjusting the piston (1) displacement range, the level of the controlled voltage (V_M) is adjusted.

16. A method according to claim 14, characterized in that, in the step of dynamically adjusting the piston (1) displacement range, the voltage frequency (f_{VM}) of the controlled voltage (V_M) is adjusted to a value equal to the value of the resonance frequency of the linear compressor (100).

17. A method according to claim 14, characterized in that, in the step of monitoring the piston (1) displacement throughout the operation of the linear compressor (100), it is foreseen to measure a feed phase (ϕ_C) of a feed current (i_A) and a dynamic phase (ϕ_P) of the piston (1) of the linear compressor (100), and

to measure the difference between the feed phase (ϕ_C) and the dynamic phase (ϕ_P) and to establish a measured phase (ϕ_{PC}).

18. A method according to claim 17, characterized in that, after the step of establishing the measured phase (ϕ_{PC}), there is a step of increasing the range of piston (1) displacement when the value of the measured

phase (ϕ_{PC}) is positive or a step of increasing the range of piston (1) displacement when the value of the measured phase (ϕ_{PC}) is negative.

19. A method according to claim 18, characterized in that, in the steps of increasing or decreasing the range of piston (1) displacement, the value of the range of piston (1) displacement is adjusted so that the value of the measured phase (ϕ_{PC}) will be null.

20. A method according to claim 19, characterized in that, after the step of increasing or decreasing the range of piston (1) displacement, there is a step of awaiting the passage of a stabilization time.

21. A method according to claim 20, characterized in that, after the passage of the stabilization time, the difference between the feed phase (ϕ_C) and the dynamic phase (ϕ_P) is measured again.

22. A method of controlling a linear compressor (100), the linear compressor (100) comprising a piston (1) driven by a linear motor (10),

the piston (1) having a controlled voltage (V_M), the controlled voltage (V_M) having a voltage frequency (f_{VM}) applied to the linear motor (10) and adjusted by a processing unit (22),

controlled voltage (V_M) generating a feed current (i_A) that circulates in the linear motor (10),

the method being characterized by comprising the steps of:

- measuring a feed phase (ϕ_C) of the feed current (i_A) and a dynamic phase (ϕ_C) of the piston (1) of the linear compressor (100), and

- measuring the difference between the feed phase (ϕ_C) and the dynamic (ϕ_P) and establishing a measured phase (ϕ_{PC}),

- dynamically adjusting the range of displacement in function of a variation in demand of the linear compressor (100), so that the linear compressor will be kept in resonance throughout the variations in demand of the cooling system (20).

23. A method according to claim 22, characterized in that, in the step of dynamically adjusting the range of piston (1) displacement, it is foreseen to adjust the feed voltage (V_A) so that the value of the measured phase (ϕ_{PC}) will be null.

24. A method according to claim 22, characterized in that, after the step of establishing the measured phase (ϕ_{PC}), there is a step of increasing the range of piston (1) displacement when the value of the measured phase (ϕ_{PC}) is positive or a step of decreasing the range of piston (1) displacement when the value of the measured phase (ϕ_{PC}) is negative.

25. A method according to claim 24, characterized in that, after the step of increasing or decreasing the range of piston (1) displacement, it is foreseen to await the passage of a stabilization time.

26. A method according to claim 25, characterized in that, after the passage of the stabilization time, there is a new measurement of the difference between the feed phase (ϕ_C) and the dynamic phase (ϕ_P).

27. A cooling system (20) comprising a linear compressor (100), the cooling system (20) comprising an on/off thermostat actuating the linear compressor (100),

a linear compressor (100) comprising a piston (1) driven by a linear motor (10)

a piston (1) having a displacement range controlled by means of a controlled voltage (V_M), the controlled voltage (V_M) having a voltage frequency (f_{MV}) applied to the linear motor (10) and adjusted by a processing unit (22),

the cooling system (20) being characterized in that:

the range of piston (1) displacement is dynamically controlled in junction of a variable demand of the cooling system (20) during the period when the thermostat turns on the linear compressor (100),

the linear compressor (100) having a resonance frequency, the processing unit adjusting the range of piston (1) displacement so that the linear compressor (100) will be dynamically kept in resonance throughout the variations in demand of the cooling system (20).

28. A linear compressor (100) controlling system, the system being characterized by comprising a processing unit (20) measuring a range of piston (1) displacement and the processing unit adjusting the range of the piston (1) displacement to dynamically keep the linear compressor (100) in

resonance throughout the variations in demand of the cooling system (20).

29. A control system according to claim 28, characterized in that the control central measures a feed phase (ϕ_C) of a feed current (i_A) and a dynamic phase (ϕ_P) of the piston (1) of the linear compressor (100),

the processing unit (22) measuring the difference between the feed phase (ϕ_C) and the dynamic phase (ϕ_P) and establishing a measured phase (ϕ_{PC}), the processing unit (22) adjusting the controlled voltage (V_M) so that the value of the measured phase (ϕ_{PC}) will be null.

30. A system according to claim 29, characterized in that the range of piston (1) displacement is adjusted by means of a controlled voltage (V_M), the controlled voltage (V_M) having a voltage frequency (f_{VP}) being adjusted by means of a variable frequency inverter, the inverter dynamically adjusting the voltage frequency (f_{VP}) of the controlled voltage (V_M) to a value equal to the resonance frequency of the linear compressor (100), as the variations in demand of the cooling system (20) occurs.